Electromagnetic Radiation

Created by charged particles (electrons)
move at $c=3.00\times10^{8}$m/s in a vacuum

Type	wavelength	frequency $f=c/\lambda$
Radio	10^{0}m or longer	10^{8}Hz or less
micro	$10^{-2}$to 10^{0}m	10^{8} to 10^{10}Hz
Infrared	$10^{-7}$to 10^{-2}	10^{10} to 10^{15}Hz
visible	4×10^{-7} to 7×10^{-7}m	about 10^{15}Hz
Ultraviolet	10^{-8} to10^{-10}m	10^{16} to 10^{18}Hz
X-rays	10^{-10} and shorter	10^{18}Hz and longer
gamma	10^{-10} and shorter	10^{18}Hz and longer

The difference between X-rays and gamma rays are that x-rays are produce by hitting fast electrons into certain materials, like tungsten
gamma rays are produced in the nucleus and nuclear interactions.

eg. the radio station 101.1 FM sends signals at 101.1 MHz. What is the wavelength of the radio wave to 3 sig figs?
(AM signals are in kHz, by the way).
$M=10^{6}$
$101.1\times10^{6} = f$
$c=3.00\times10^{8}$m/s

$v=\lambda f$ $\lambda=3.00x10^8/101.1x10^6 = 2.96$ m

Intensity is the power of light spread over an area.

Light bulbs spread light in a sphere outwards.

What is the intensity of light 1.0m from a 100W light bulb in W/m^2? (surface area of a sphere is $A=4\pi r^2$)
$I=P/A = P/(4\pi r^2) = 100W/4\pi(1.0m)^2$
$= 100/(4xpi)=7.957747154594766$ 9=8.0W/m^2

b) what if you are 3.0 m from the bulb?
$I=P/A = P/(4\pi r^2) = 100W/4\pi(3.0m)^2$
$= 100/(9x4xpi)=0.884194128288307$ =0.88 W/m^2

c) what is the ratio of your answer to b / answer to a?
1/9

d) how does intensity vary with distance?
$I \propto 1/x^2$ inverse square relationship for light spreading in all directions (not lasers)
$I = k/x^2$ k is a constant (if the power output is constant)

Activity 30 minutes- Draw and describe:
1. laser hitting mirror at various angles
2. laser hitting plastic block at various angles
3. binocular crystal - draw and look through hole. Look at finger and move up/down.
4. hanging crystal in window

5. p344 problems 1-7, 9, 14 use $I \propto 1/x^2$
6. prep for lab p45 and 46
7. watch videos: http://physics-pages.wikispaces.com/Light

next class - hand back quizzes + do lab
http://physics-pages.wikispaces.com/file/view/LAB%2BMANUAL%2BPhysics%2B11.pdf/604456999/LAB%2BMANUAL%2BPhysics%2B11.pdf
p45 and 46 (looks like two labs but write it like one lab with two parts, part 1 air to water part 2 water to air)
Come to class with your lab writeup prepped with a purpose, leave a space for hypothesis, procedure (just write "refer to lab manual p45 and 46), and data tables, properly labelled.